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INSTRUMENT SHOP

BIRD

INSTRUCTION book

MODEL 8329

INSTRUCTION MANUAL

for

Model 8329 TENULINE®

RF Coaxial Attenuator

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Model 8329 RF Attenuator

Summary of Characteristics

Electrical Specifications

Power Rating	2000 Watts
Attenuation*	30dB ±1/2 dB DC to 500 MHz
RF Input and Output Impedance	50 ohms
Input VSWR	1.10 max. DC to 500 MHz
Output VSWR	1.15 max. DC to 500 MHz
Input Connector	Female LC
Output Connector	Female N
Operating Position	Horizontal only

*Note - Special calibration to 1000 MHz is obtainable on order.

Mechanical Specifications

Weight	33 pounds (15 kg)
Finish	Light Navy Grey baked enamel (MIL-E-15090)
Dimensions	6-3/8"W x 10-3/4"H* x 23-5/8"L** (161.9 x 273 x 600mm) *(11-1/2 (292mm) nom. to top of vent plug) **Using respective LC & N Connectors normally supplied.
Mtg. Dimensions	21-1/4" x 5-3/8" rectangle (540 x 136.5mm)

Bird Electronic Corp.
Cleveland, Ohio

MODEL 8329 TENULINE® Attenuator

SECTION I - GENERAL DESCRIPTION

The Model 8329 RF Attenuator is a low-reflection resistance network for use in the measurement of high power in controlled and known amounts. It is an electrical "T" pad immersed in a liquid coolant, using principles employed in Bird TERMALINE® RF Load Resistors, which permit the use of large resistive elements at high frequencies while maintaining a low VSWR over a wide frequency range. The Attenuator is designed to match the most commonly used 50-ohm transmission line systems.

The Model 8329 TENULINE is a self-contained instrument with input power capability of 2000 watts, intended for cooling in air of normal ambient temperatures. The Attenuator unit is rectangular in shape with transverse cooling fins evenly spaced along its entire length. Attached to the front and rear fins are mounting flanges. These flanges act as supports for free standing use or mounting brackets for optional fixed mounting. Mounting holes are provided for this purpose, see Installation, Section III.

The RF input and output connectors are of the Bird "Quick-Change" style to permit rapid interchange of connector types. These "QC" connectors are located on the front and back of the unit. See Paragraph 4, of Maintenance, Section V, for changing procedure.

A system of carbon film-on-ceramic cylindrical resistors immersed in a heat resistant dielectric coolant constitutes the RF Section Assembly. The cooling fluid and the tapered input resistor housing provide the proper electrical characteristics for the coaxial line attenuation throughout the internal circuitry.

By convection, the cooling fluid carries the heat generated in the various resistor elements to the walls of the coolant housing. This housing is encased in a set of radiating fins which are brazed to its outer surface. These radiating fin surfaces dissipate the heat of the coolant into surrounding air.

The unit may be used for isolation of power sources up to 2000 watts and for low level monitoring. The low power value obtained at the output of the Attenuator could easily be read on an oscilloscope or terminated in a small RF load resistor.

SECTION II - THEORY OF OPERATION

The Model 8329 Attenuator is a symmetrical "T" pad, with the power distribution on the legs being different. Therefore, the value of resistance on each leg varies according to the power it is to absorb. On the input resistance Element, a proportionately larger resistor is of course required for its much greater power dissipation. A "T" configuration is used to provide equal input and output impedances for the 50-ohm transmission line attenuation.

The input resistor is joined to the "T" leg joint in an exponentially tapered housing to provide a linear reduction in surge impedance directly proportional to the distance along the resistor. The output resistor is enclosed in a housing designed to return to the characteristic impedance of 50-ohms. This produces a uniform and practically reflectionless attenuation characteristic over the stated frequencies of the Attenuator.

The dielectric coolant is carefully chosen for its desirable dielectric properties, to which the diameters of the resistors and housings are matched, and for its high thermal stability characteristics Expansion of the coolant, when power is applied to the attenuator, is accomplished by allowing the air, which is compressed by the expanding coolant, to escape through the vent plug on the top face of the unit.

SECTION III - INSTALLATION

The RF attenuator is self-contained. No additional equipment or outside power is required. It should be placed as close as possible to the operating point as feasible. Handles are affixed on the upper portion of both ends of the Attenuator for ease in carrying the unit.

The Attenuator is designed for either fixed installation or portable use. By means of four 5/16-inch fasteners fed through the 3/8-inch (9.5 mm) base flange holes, the unit may be secured to an operating table, bench, etc., on a 5-3/8" by 21-1/4" (136.5 mm by 540 mm) rectangular plane, or it may stand free if desired. This Attenuator is designed for operation in a horizontal plane only, with mounting brackets down. NOTE: DO NOT OPERATE IN ANY OTHER MANNER. The coolant venting system will not work otherwise.

CAUTION

The solid shipping plug must be removed and replaced with the vent plug before operating the Attenuator. The receptacle for the shipping and/or vent plug is on top of the coolant tank at the input end of the Attenuator. Failure to do this could result in damage to the unit and endanger the operator's safety. Use the O-rings respective to each plug when they are screwed into place. Do not interchange O-rings. The shipping plug should be replaced whenever the unit is to be shipped.

SECTION IV - Operation

Connect the Model 8329 input to transmitting equipment and its output to termination or load. If the Attenuator is to be operated at both maximum power and frequency values, use a Male LC Type plug with suitable cable (such as RG-218/U or RG-220/U)on the input and Male N plug with appropriate cable or load on the output (These connect to the RF fittings normally supplied). Other connection arrangements may be acceptable for lower values, see Maintenance, Section V.

The front or input end of the Attenuator is identified by the four-inch (102 mm) diameter diecast aluminum disc on which the connector is mounted. The rear face of the Unit is stencilled "output" above the connector. Caution should be taken not to couple the Attenuator backwards to the direction of power flow. Destruction of the output resistor will result.

Before applying any RF power to the Attenuator be certain to check that the Breather is in place in the vent hole. See Section III - Installation.

In operation of this Attenuator take care not to exceed its power handling capabilities. See Summary Specifications, Sheet -A-.

SECTION V - MAINTENANCE

1. General

The Model 8329 TENULINE Attenuator is rugged in construction and relatively uncomplicated in design. It should require only nominal routine attention. The Attenuator is intended to operate for long periods of time if care is taken not to exceed its power handling capabilities.

The outside surface of the instrument should be wiped free of dust and dirt occasionally. Clean the input and output connectors and their sockets if necessary, with Inhibisol, its equivalent, or trichlorethylene, on a cotton swab stick. Take special care to clean the inner metallic surface and the exposed faces of the teflon insulators. Provide adequate ventilation and observe normal precaution when using dry cleaning solvents.

2. RF Section Assembly

Accurate measurement of the dc resistance between the input to ground, output to ground, and input to output will provide a good check of the condition of the Attenuator. For these measurements, a Resistance Bridge with an accuracy of one percent or better at 50 ohms (such as Leeds & Northrop Model 5305 Test Set) should be used. Use low resistance leads, preferably a short piece of 50-ohm cable (RG-8A/U or RG-9B/U) attached to Male plugs which match the Female "QC" connectors on the Attenuator. When the resistance of the equipment is checked at room temperature, the measured readings

should be close to the values listed on the data sheet shipped with the unit; namely, a normal 93.7 ohms input to output and 50-ohms from either end to ground.

To replace the RF Section Assembly, remove the vent valve and pour the coolant into a clean container. Next, release the V-band clamp by removing the 10-32 holding screw in its clamping blocks at the input connector end. The RF Section Assembly, including both input and output connectors, are now free to be extracted from the input end of the radiator housing. Pull the Assembly straight out. Do not twist or bend. This RF Section Assembly is not subject to further disassembly in the field. A defective assembly must be returned in its entirety for repair. To install the RF Section Assembly, reverse the above procedure. Check the condition of the seals and take special care in the replacement of the O-ring seal (#5-176) on the output end of the RF Section Assembly. If either of the O-ring seals show evidence of scars or deterioration, they should be replaced.

3. Coolant

The level of the dielectric coolant should remain constant in the unit after prolonged usage under normal operating conditions. As shipped, the coolant is at a factory determined level, and should be about 3" (76.2 mm) below vent socket top face. However, loss of up to 10 percent of the full tank capacity should not impair operating efficiency of the Attenuator. Inspect occasionally around the clamping band and the input end assembly for possible coolant leakage.

Tighten clamping screw if necessary, and make certain the O-ring seal is in good condition.

If any coolant leakage at the output end assembly is noticed, the O-ring seal (#5-176) may need replacing. For replacement, proceed as described in paragraph 2, of this section.

4. RF Input and Output Connectors

It must be clearly understood that at the full power and frequency capability of this Model, see Summary Sheet, page -A-, only Type LC, LT (Female or Male) or 7/8" EIA (Air Line) connectors will be adequate on the input end.

The input and output connectors are both of a special Bird Quick-Change "QC" design which permits facile interchange of connectors with only simple tools. This process does not in any way disturb the coolant seal or interfere with the essential coaxial continuity of the Attenuator.

Even though connectors are easily changed, as described below, for any of the other connector types listed herein, input power values must be limited to the specified parameters of the selected type of connector.

If replacement of the RF input connector becomes necessary, proceed as follows:-

(1) Remove the four #8-32 x 5/16" round head machine screws from the corners of the RF connector.

(2) Pull connector straight out.

(3) Reverse the preceding procedure to install new connector, making certain that the projecting center contact pin of the "QC" connector is carefully engaged and properly aligned with the mating socket of the Attenuator.

4. RF Input and Output Connectors (Continued)

Other AN Standard Type connectors may be specially obtained from Bird Electronic Corporation. Suggest available "QC" connector types as follows:-

N-Fem	4240-062	LC-Fem	4240-031	C-Female	4240-100
N-Male	4240-063	LC-Male	4240-025	C-Male	4240-110
HN-Fem	4240-268	LT-Fem	4240-018	UHF-Fem	(SO-239) 4240-050
HN-Male	4240-278	LT-Male	4240-012	UHF-Male	(PL-259) 4240-179

7/8" EIA Air Line 4240-002

ACCESSORIES

Overload Thermoswitch

As an optional item, a thermoswitch may be included for protection against overloading of the load resistor. The front face of the radiator unit has a 3/4-14 tapered pipe thread hole in the upper center (closed with a hex socket pipe plug). When ordered, the thermoswitch assembly P/N 8329-028 is screwed into this threaded hole in its place.

Where the Model 8329 TENULINE Attenuator was originally received without the thermoswitch, proceed as follows to install the switch:-

Tilt the unit up at front end and stand radiator with front straight up (coolant will not contact the breather hole if radiator is handled this way). Caution must be taken not to damage, or apply excessive pressure on output connector while unit is in this position. Using a 9/16" hex socket wrench, remove pipe plug from face of radiator.

Taking the thermoswitch, remove connector assembly P/N 2450-018 by loosening knurled flange nut adjacent to the thermoswitch head, unscrew nut and remove connector assembly from thermoswitch body P/N 8329-027. Apply pipe seal compound, "Lockite" sealant with teflon (or equivalent), to the threads of the thermoswitch body and screw into radiator socket. Tighen with 1-1/8" flat wrench.

Unscrew cable clamp portion from back end of connector assembly P/N 2450-018. Thread transmitter interlock leads through cable clamp, and solder to lugs inside the connector plug. Reassemble the cable clamp, and screw assembly onto jack of thermoswitch.

Coolant temperature rise above a safe limit will open thermoswitch contacts. With the interlock leads connected in series with the transmitter interlock, RF power to the load resistor will be cut off.

REPLACEMENT PARTS LIST

Name	Part No.
RF Section Assembly	8325-035
Radiator Assembly	2450-100-5
Clamping Band Assembly	2430-043
O-Ring, Vent Valve	5-504
Vent Breather	5-835
O-Ring, Shipping Plug	5-502
Shipping Plug	2450-049
Chain Assembly	8180-094
Connector, Female N	4240-062
Connector, Female LC	4240-031
Coolant, Dielectric 1.4 gal., approx. (5.3 liter)	5-1070
O-Ring, Input End	5-230
O-Ring, Output End	5-176

ACCESSORIES

Thermoswitch	8329-028
Plug, Thermoswitch	5020-103

Bird Electronic Corp.
Cleveland (Solon), Ohio

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